FINAL REPORT

FA2836-12-1-4058

Understanding and Harnessing the Power of Ideas, Persuasion and Trust

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1. REPORT DATE **17 SEP 2013**	2. REPORT TYPE **Final**	3. DATES COVERED **29-05-2012 to 05-08-2013**	
4. TITLE AND SUBTITLE **Understanding and Harnessing the Power of Ideas, Persuasion, and Trust: Enabling Collaborative Performance and EffectiveCoalitions**		5a. CONTRACT NUMBER **FA23861214058**	
		5b. GRANT NUMBER	
		5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) **Kenneth Boff**		5d. PROJECT NUMBER	
		5e. TASK NUMBER	
		5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Socio-Technical Sciences,8260 Barton Farms Blvd,Sarasota, FL 34240,United States,FL,34240**		8. PERFORMING ORGANIZATION REPORT NUMBER **N/A**	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) **AOARD, UNIT 45002, APO, AP, 96338-5002**		10. SPONSOR/MONITOR'S ACRONYM(S) **AOARD**	
		11. SPONSOR/MONITOR'S REPORT NUMBER(S) **AOARD-124058**	

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Work on identifying and understanding the foundation research challenges for trust and influence involved the (a) the identification and engagement of over 40 global thought leaders from across the behavioral, social, political, anthropological and computer sciences to aid in the identification of current knowledge gaps and viable multi-disciplinary and multi-cultural approaches, (b) the expert assessment of leading edge advances and options for leveraging their value to the USA, and the (c) stimulation and elaboration of select research problems as whitepapers in collaboration with leading international researchers and to provide detailed evaluations of their option value to the Air Force Office of Scientific Research and DoD.

15. SUBJECT TERMS
Behavioural Science, Trust

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**27**	

Understanding and Harnessing the Power of Ideas, Persuasion and Trust

INTRODUCTION:
The objectives of this effort were (a) to identify and understand the research challenges that underlie the effective harnessing of the power of ideas, persuasion and trust to enable collaborative performance and (b) apply acquired perspectives, data and insights to leveraging the scope and thrust of the AFOSR basic science portfolio on trust and influence. Prior work * focused on characterizing the causal dynamics of ideas and how modes of representation and conveyance promote influence, aid persuasiveness and engender trust. The present effort built on this conceptual foundation.

APPROACH and ACCOMPLISHMENTS:
Work on identifying and understanding the foundation research challenges for trust and influence involved the (a) the identification and engagement of over 40 global thought leaders from across the behavioral, social, political, anthropological and computer sciences to aid in the identification of current knowledge gaps and viable multi-disciplinary and multi-cultural approaches for closing them (see Table 1), (b) the expert assessment of leading edge advances and options for leveraging their value to the USAF (see Tables 2 & 3), and the (c) stimulation and elaboration of select research problems as whitepapers in collaboration with leading international researchers and to provide detailed evaluations of their option value to the Air Force Office of Scientific Research and DoD (See Table 4).

a. **Expert Network**: In the course of the last year, travel was constrained, so, as a cost-effective alternative, I engaged in extensive online interactions with the research scientists detailed in Table one. These interactions centered on discussions of their personal research and perspectives on where significant challenges remained to be addressed. Some of these interactions, in turn, progressed to dialogs where specific elements of the research challenges were further elaborated.   A subset of these correspondents were subsequently invited to submit concept white papers elaborating these ideas in a form responsive to BAA-AFOSR-2013-0001.

b. **Conferences attended.** In the course of the reporting period, I attended two conferences/workshops with the intent of establishing contacts with new subject matter experts in gap areas relevant to the trust and influence research challenges and the AFOSR BAA.

    a. NATO HFM Specialists Meeting on the topic of "Social Media: Risks & Opportunities in Military Applications." 16 – 18 April 2012, Tallinn, Estonia. (Note that this grant had been anticipated to start in early April and encompass

* Rouse, W.B., & Boff, K.R. and Sanderson, P (2012). Complex socio-technical systems - Understanding and influencing the causality of change. IOS Press: Amsterdam.

this meeting). The meeting included about 90 international attendees from NATO and Partners for Peace nations plus Japan and Israel.   The USAF Chief Scientist attended and was actively involved throughout the meeting. The meeting focused on military supported research from both the private and public sectors and included S&T on the use and implementation of social media, trends and future implications, security risks associated with social media, best practices and the future of social media, the technology of social media, analysis of social media, cultural specific issues related to social media implementation, communications through social media and the economics of social media implementation. Several very useful contacts and contacts by referral were acquired.

b. Second South East Asian Network of Ergonomics Societies Meetings held at Langkawi, Malaysia, July 8-12 2012.

From time to time, it is important to re-establish the bases for doing business (i.e. the business of science) in Asia… which at the same time also serves as a relevant background for my participation at this regional conference. In traditional Asia, the establishment and building of relationships is a necessary prerequisite to collaborative work. Meeting people, particularly senior people of importance can be difficult without an intermediary who can provide an introduction that is, in effect, a warrant of legitimacy. As you meet people and build trust in the relationship, they, in turn, become potential intermediaries for assisting you to establish new relationships thereby enabling a growing sphere of influence.

As an organization, AOARD has established many trusted relationships with scientists and engineers throughout Asia, a number of which have outlasted the PM who established them. Attendance at regional technical conferences can also be an effective way to meet and begin building relationships with local S&Es though it is not always the best path to meeting the more senior people.

Historically, Asia has not been a strong innovator in the behavioral and social sciences. Most of the successful S&Es in these areas were educated in the US but have had a hard time finding the resources to conduct research outside their academic responsibilities. As a result, much of the past research has been pretty mundane and trailing the state of the art. Human factors related research has tended to be ergonomic-centered on issues of measurement and practice with a strong orientation towards Occupational Health and Safety.

Over the last 10-12 years, there has been growing surge of R&D driven, in large part, by the revolution in Information Technology, which has profoundly affected Asian society, culture, education and military capabilities. The social sciences have, in turn, been energized by state of the art research in HCI,

cognitive science, cultural cognition, modeling and simulation etc. As expected, the level of advancement and quality of science varies significantly, in line with state economics, across the Asian countries. The highest end work, (i.e., competitive with the US) can be found in Singapore, Korea, Taiwan, Japan and China. Small pockets of good work exist in India, the Philippines and Malaysia.

SEANES or the South East Asian Network of Ergonomic Societies of the Philippines, Thailand, Malaysia, Indonesia and Singapore is of particular interest (1) because of its intent to sharpen regional standards to meet IEEE standards for conducting and reporting research. (2) the explicit broadening of its purview from traditional "nuts and bolts" ergonomics to encompass IT and cognitive sciences motivated research and (3) The 2012 Chair and Host of SEANES was a successful AOARD grantee who has provided valuable support over a decade to AOARD as an expert intermediary to SMEs across Asia. With these aspects in mind, I agreed to participate on the organizing committee and serve as a senior mentor of sorts. Other prominent members of the organizing Committee included senior representatives from UK, US, Canada, the Netherlands and Australia.

My evaluation of the meeting is that it was only FAIR or roughly 2 on a 5-point scale. Given the countries involved, there was an evident improvement of the standards of research but with clear room for further improvement. Only a small number of papers that were outside the traditional scope of ergonomics passed peer review that was, from my perspective, somewhat disappointing. However, on the bright side, a couple of these papers were interesting and showed promise. Several potentially good contacts were made with established PIs from the Philippines and Indonesia with whom I intend to follow up.

c. **Technical and Proposal Reviews:**
   I attended and served as a subject matter expert at four onsite reviews (Stanford University, CA, EOARD London, UK, Tokyo, JP and WPAFB, OH.) as detailed on Table 3. Two of these reviews required expert content assessments provided as feedback to the AFOSR portfolio manager. Four of these reviews involved the offsite formal peer assessment of the quality of proposed efforts. Additionally, peer-reviews were accomplished on a case-by-case basis for out of cycle or unsolicited proposals. Collectively, these involved review of approximately 25 proposals.

d. **Stimulation of Concept Whitepapers and Proposals**: As a result of the online interactions with the investigators shown in Table 1, Twenty-two (22) white papers were solicited. Thirteen of these were Whitepapers were delivered and subsequently peer-reviewed as illustrated in Table 4. Based on the peer-reviews, seven of these white papers were invited to prepare full proposals for grants or conferences and are in various stages of processing for award.

TRUST AND INFLUENCE RESEARCH CHALLENGES:

1. <u>**Nature of Ideas, Ideologies and Influence:**</u>
   a. What underlies "attractiveness" and "stickiness" of compelling fringe ideas?

   b. What is the role of social-cultural context (e.g. religious, political, socio-economic, etc.)?

   c. How do modes of representation and conveyance (e.g. rumor, propaganda, ideology, etc) promote influence, aid persuasiveness and engender trust of fringe ideas?

   d. What enables some ideas to go viral?

   e. How can we understand the degree to which an idea is genuinely 'fringe' and not simply a product of suppression in authoritarian or semi-authoritarian societies?

   f. How are social belief systems formed and how do they become entrenched?

   g. Can the causal power of ideas be measured and predicted?

2. <u>**Power to influence:**</u>
   a. What underlies the plausibility and power of rumors and fringe ideas among the SFGs in which they circulate?

   b. How do contemporary influence theories (such as Cialdini's influence principles) hold up in a digital world? We need a science and supporting theories to support "socio-digital influence.

   c. What are the precursors of social action arising from fringe ideas?

   d. When and how best can "out-of-kilter" belief systems be rebutted with minimal unintended consequences?

   e. What empowers highly influential humans in competitive environments and what are the means for sustaining or countering influence in a dynamic and changing world?

   f. Why do leaders in the "spotlight" of a trust violation typically adopt dysfunctional, self-destructive trust repair strategies, and what are alternative options?

   g. What is the psychology of counter-persuasion?

3. **Transmission:**

    a. What cultural issues affect the power of persuasion?

    b. How are ideas and memories that contribute to identity socially transmitted?

    c. What can be expected as a result of emerging technologies that change the nature of social interactions?

    d. How do inter-cultural communication processes and media between members and non-members of fringe groups influence the dissemination and acceptance of outlier ideas?

    e. Modeling the spatial and temporal constraints of social media on mass persuasion and community formation to better understand the bases of short-term local effects vs longer-term wide-area effects

    f. What are the options and limitations of analytic, empirical and modeling approaches to characterizing, studying and understanding the *propagation and influence of compelling ideas*?

TABLE 1: GLOBAL THOUGHT LEADERS CONTACTED 2012- 2013

AUS	Hussein Abbass	U of New S Wales Canberra, Australia	The Trust Machine
AUS	Phillippa Pattison	Deputy Vice-Chancellor, U of Melbourne	Psych; Complex, networked social systems
AUS	Garry Robbins	Psych; U of Melbourne	Social networks/Stat
AUS	Scott Sharp	Mathematical, Environmental & Phys Sci, Australian Defence Forces Academy	Processes of social and cultural marginalization
EGYPT	Abdel-Hamid Abdel Latif	Chairman, the Egyptian Research & Training Center	Sociologist, intergenerational values
INDIA	Purnima Singh	Department of Humanities and Social Sciences, IIT Delhi	Social Psych; Radical group behavior; Social justice
INDON	Hamdi Muluk	Soc & Pol Psych, U of Indonesia	Peace Psychology, Religious fundamentalism/terrorism
INDON	Mark Woodward	Faculty of Uslluluddin and Islamic Thought, Sociology of Religion Department, Su11ail Kalijaga State Islamic University And Arizona State University	Sociology of Religion
JAPAN	Greg Dalziel	Keio University Tokyo	Rumors
JAPAN	Toshiyuki Inagaki	Department of Risk Engineering, U of Tsukuba	Trust and Robotics
JAPAN	Akira Namatame	Dept. of Computer Science, National Defense Academy, Yokosuka, 239-8686, Japan	Complexity, Complex social-technological systems
JAPAN	Yoshifumi Nishida	AIST-Odaiba: Digital Human Research Center	
JAPAN	Pao Sriprasertsuk	Grad School of Global Info &Telecom Studies, Waseda U, Tokyo	
JAPAN	Roland Kelts JP & US	author, journalist and speaker	Digital Youth Culture
KOREA	Uichol Kim	College of Business Administration, Inha University, Korea	Human rights & political culture
Malaysia	Prof. Dr. Abdul Rahman Embong	nstitut Kajian Malaysia & Antarabangsa (IKMAS) Institute of Malaysia & International Studies Universiti Kebangsaan Malaysia	
Malaysia	Shamsul Haque	Sch of Med & Health Sci, Monash U, Sunway	Psych, Cultural beliefs & Identity
Malaysia	Halimahtun Khalid	Principal Scientist, Damai Sciences Sdn Bhd Kuala Lumpur, Malaysia	Human and cultural factors
Malaysia	Mei-Hua Lin	Dept of Psych, Sunway U	National & Cognitive differences Research
Malaysia	Nor Laila Md Noor	Systems Sci Studies, Faculty of Comp & Math, Sci, Universiti Teknologi Mara	enterprise work and community interaction
Malaysia	Helen Ting	IKMAS (Institute of Malaysian & International Studies), Selangor	Pol Science: Inter-ethnic & Inter-cultural relations
Malaysia	Shafiz Affendi Mohd Yusof	College of Arts and Sciences (School of Computing), Universiti Utara Malaysia, Sintok, Kedah, Malaysia	Information Sharing Behavior in Social Networks
Malaysia	Nasriah Zakaria	Medical Informatics and E-learning Unit, Medical Education Department College of Medicine King Saud U, Riyadh, Kingdom of Saudi	Swift Trust Formation in Global Virtual Teams

			Arabia
NE	Ilja van Beest	Prof, Social Psychology Tilburg U	coalition formation, social exclusion, negotiation, emotions
NZealand	Matthew Dentith	Auckland, NZ	Investigating Conspiracy Theories
NZealand	James H. Liu	Psych, U of Wellington	intercultural communication, social and cognitive processes in collaboration
Taiwan	Hao-Chuan Wang	Assist Prof in Dept of Computer Science, National Tsing Hua University	Political Sociology
Turkey	Nora Fisher Onar	Ahçeşehir U, Political Science and International Relations. Also, Director, SouthEast Eur Stud at Oxford branch in Istanbul	Political Sociology
Sing	Cheong Siew Ann	National Technical University (NTU)	Modeling of how to Harness Trust and Influence in Cyber-space
Sing	Syed Adnan Ali Shah BUKHARI	Assoc Res Fellow & Team Leader South & Central Asia, International Centre for Political Violence and Terrorism Research ICPVTR, NTU	
Sing	David Chan	Singapore Management U	Statistics
Sing	Axel Gelfert	Department of Philosophy, Nat U of Singapore	Philosophical problems of model-based representation; Rumors
Sing	Don Ferrin	Organizational Behaviour and Human Resources, Lee Kong Chian School of Business Singapore Management U	Trust
Sing	Martin Helender	Nanyang Technological University, School of Mechanical & Aerospace Engineering	Human Computer Interfaces and interaction
Sing	Trevor Penney	Nat University of Singapore (NUS)	Using Brain-State Information to Facilitate Conditioned Attitude Formation
Sing	Michelle SEE	Nat University of Singapore (NUS)	Using Brain-State Information to Facilitate Conditioned Attitude Formation
Sing	Miao Chun Yan	Director of Emerging Research Lab, School of Computer Engineering, Nanyang Technological University	
UK	Angelo Cangelosi	Professor of Artificial Intelligence and Cognition, University of Plymouth	Cognitive robotics
US	Scott Atran	U of Michigan	Mutual influence of moral values, mental models and social dynamics on intergroup conflict
US	Michele Gelfand	U of Maryland	Culture, contagion of conflict
US	Arie Kruglanski	U of Maryland	
US	Michael Langone	Counseling psychologist, Naples FL	Cultic Studies
US	Jacob Shapiro	Princeton University	Terrorism, Development, and Governance

TABLE 2: CONFERENCES ATTENDED

RTO Specialists Meeting on "Social Media: Risks and Opportunities in Military Applications"	16 – 18 April 2012	Tallinn, Estonia
Second South East Asian Network of Ergonomics Societies Meetings	July 8-12 2012.	Langkawi, Malaysia

TABLE 3: FORMAL TECHNICAL & PROPOSAL REVIEWS

Minerva Annual Review, "Terrorism, Governance and Development"	June 5, 2012	Stanford University, CA	Joe Lyons
LRIR Reviews	June 2012	Remote Proposal reviews (7)	Joe Lyons
BAA Proposal Reviews	Aug/Sept 2012	Remote Proposal reviews	Joe Lyons
AFOSR Young Investigator Proposals	Aug 2012	Remote Proposal reviews	Joe Lyons
ISO Strategy	2-15 September 2012	EOARD London UK AOARD, Tokyo, Japan	Col K Gresham
AFOSR BAA Trust Review	14-17 January 2013	Wright-Patterson AFB, OH.	Joe Lyons
MINERVA proposal reviews	Feb 2013	Remote Proposal reviews (7)	Joe Lyons & Erin Fitzgerald/OSD
Multiple single proposal reviews	5-12 to 4-13	Remote Proposal reviews	Joe Lyons

TABLE 4: Whitepapers Solicited and Reviewed		
PI/ E-mail	**Affiliation**	**Title**
Halimahtun M. Khalid, et al* halimahtun@damai-sciences.com	Damai Sciences Sdn Bhd, Malaysia	Trusting Humanoid Robot Undertake Social Tasks (3-11-13)
Ilja van Beest* I.vanBeest@uvt.nl	Tilburg University, NE	Meaning Seeking in Fringe Group Members
Hussein Abbass nzakaria@ksu.edu.sa	U of New S Wales Canberra, Australia	The Trust Machine
Cheong Siew Ann Akira Namatame** nama@nda.ac.jp Shu-Heng Ch	NTU Sing NDU, Japan NCU, Taiwan	Modeling of how to Harness Trust and Influence in Cyber-space
Abdel-Hamid Latif hamidlatif.79@gmail.com	Egyptian Research and Training Center, Cairo, Egypt	Building Trust and the Power of Social Media in the Road to Revolution and Democratic Transition: The Egyptian Case
Garry Robins et al garrylr@unimelb.edu.au	University of Melbourne, AU	Dynamic multilevel analysis of social media for attitudinal and disaster management applications
Shafiz Affendi Mohd Yusof, et al s.mohdyusof@seu.edu.sa	Saudi Electronic University, Riyadh, Saudi Arabia	"Tell Me Something": Exploring the Impact of Information Privacy Concerns on Information Sharing Behavior in Social Network Sites
Norhayati Zakaria* nzakaria@ksu.edu.sa Hiroshi Yama	Saudi Elect U, SA Osaka City, JP	You are a Stranger! Examining the Process of Swift Trust Formation in Global Virtual Teams from a Cultural Perspective
Matthew Dentith m.dentith@auckland.ac.nz	Auckland, NZ	Investigating Conspiracy Theories
James Liu et al* james.liu@vuw.ac.nz	Victoria University of Wellington, NZ	Implicit and Explicit Attitudes towards America in Socio-Digital Influence:
Don Ferrin* dferrin@smu.edu.sg	SMU, Sing	First International Network on Trust (FINT) Singapore Workshop 21-23 Nov, 2013
Trevor PENNEY* Michelle SEE, psysyhm@nus.edu.sg YEN Shih Cheng	Nat University of Singapore (NUS)	Using Brain-State Information to Facilitate Conditioned Attitude Formation
Mark Woodward* MARK.WOODWARD@asu.edu	Kalijaga State Islamic University, Indonesia and Arizona State U	Workshop series on "Exploring the Roots of Intolerance"

APPENDIX 1

CURRICULUM VITAE

KENNETH R BOFF

CURRICULUM VITAE

Kenneth Richard Boff

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941-706-2455
krboff@gmail.com

POSITIONS:

• Principal Scientist, Socio-Technical Sciences	2009-
• Principal Scientist, Tennenbaum Institute, Georgia Institute of Technology	2007-2012
• Senior Technical Advisor, Asian Office of Aerospace Research and Development, Tokyo, Japan	2007-2010
• Independent Consultant	2007-
• Chief Scientist, Human Effectiveness Directorate, Air Force Research Laboratory. Wright-Patterson Air Force Base, OH	1997-2007
• Director, Fitts Human Engineering Division, USAF Armstrong Lab Wright-Patterson Air Force Base, OH	1991-1997
• Director of Design Technology, Aerospace Medical Research Laboratory	1988-1991
• Engineering Research Psychologist, Aerospace Medical Research Laboratory. Wright-Patterson Air Force Base, OH	1980-1988
• Research psychologist. AF Human Resources Laboratory Wright-Patterson Air Force Base, OH	1977-1980

EDUCATION:

Ph.D.	Experimental Psychology, Columbia University	1978
M.Phil.	Experimental Psychology, Columbia University	1975
M.A.	Experimental Psychology, Hunter College (CUNY)	1972
B.A.	General Psychology, Hunter College (CUNY)	1969

PROFESSIONAL ACTIVITIES AND MEMBERSHIPS:

• Technical Advisory Board Member: Army Research Laboratory	2013 -
• Chair, National Academy of Sciences, Soldier Systems Panel	2013 -
• Advisory Board: Southeast Asian Network of Ergonomic Societies Conference. Lankawi, Malaysia.	2012 -
• Panel Member: National Academy of Sciences, Soldier Systems Pane	2011-
• Technical Auditor, R&D portfolio of the Center for Behavioral Sciences, Liberty Mutual Insurance Co, Hopkinton, Ma	2010
• Panel Member: FAA Research Engineering Development Advisory Committee to assess cultural impacts of NextGen: The redesign and development of the Next Generation National Aerospace Management System	2010-2011
• Human Computer Interaction and Visualization Advisory Board, University of Kaiserslautern, GE (Annual meeting)	2007-2011
• Technical Reviewer, AFOSR MURI on Socio-Cultural Modeling	2008-2010
• Chair, International Workshop on The Etiology and Impact of Digital	

Natives on Societies, Culture and Commerce, Korean Advanced Institute
for Science & Technology (KAIST). Taejon, SK.   2009

- Chair, International Work Shop on Culture: Affect, Behavior and
  Cognition. Langkawi, Malaysia   2008
- Chair, FAA Human Factors R&D Advisory Committee   2007-2009
- Steering Committee: International Federation of Automatic Control
  (IFAC) Seoul, South Korea   2006-2007
- Steering Committee: HCI International 2007, July, Beijing, PRC 2006-2007
- Steering Committee: Int'l Conference on Human-Computer Interaction
  in Aeronautics (HCI-Aero 2006), Sept 2006, Seattle WA   2005-2006
- Associate Editor, Information-Knowledge-Systems Management Journal 2004-
- Editorial Board, Handbook of Human Factors, Wiley & Sons   2003-2005
- Steering Committee: HCI International 2005, July, Las Vegas NE 2004-2005
- Steering Committee; Intl Conference on Work with Computing Systems,
  Sarawak, Malaysia   2003-2004
- Steering Committee; International Symposium of Aviation Psychology,
  Dayton, OH   2002-2003
- Steering Committee: HCI International 2003, June, Crete, GR   2002-2003
- Co-Chair: RTO Symposium on the Role of Humans in Automated   2002
    Systems. Oct 2002; Warsaw, Poland.
- Member, NATO Technical Group on Battle Space Visualization:
    Paris, Amsterdam   2000-2002
- Organizing Committee, Int'l Conference on Human-Computer Interaction 1999-2000
` in Aeronautics (HCI-Aero 2000); Toulouse, FR
- Chair, RTO Symposium on Usability of Information in Battle   2000
  Management Operations. April, Oslo, Norway
- Organizing Committee, IEEE Computer Society Symposium   1998-1999
  on Human Interaction With Complex Systems '00, Champaign-Urbana IL
- Steering Committee, 8th Computer Generated Forces Conf. Orlando Fl   1998-1999
- Director, Putting Technology To Work Workshop; Sinclair College   1998
- Organizing Committee, IEEE Computer Society Symposium   1997-1998
  on Human Interaction With Complex Systems '98, Dayton OH
- Steering Committee, HCI International '00   1998-
- US National Coordinator and HF Chair, NATO Research & Technology
  Organization (RTO), Human Factors and Medicine Panel   1997-2003
- US National Coordinator, NATO AGARD Aerospace Medicine Panel   1997
- Steering Committee, HCI –Aero 98; Montreal CA   1997-1998
- Steering Committee, IEEE Info Visualization 98   1997-1998
- Steering Committee, HCI International '99   1997-1999
- Steering Committee, 2nd Conference on IE Applications and Practices   1997
- Technical Advisor, IEEE Science, Engineering & Technology   1997
  Congressional Visits Day (16-17 Apr 97)
- Advisory Committee, ASEAN Ergonomics 97, Kuala Lumpur, Malaysia   1996-1997
- Steering Committee, IEEE Visualization 97. Phoenix AZ   1996-1997
- USAF Principal Member, Human-Centered Systems Committee, National
  Science and Technology Council (NSTC)   1996-

- Steering Committee for Establishment of Ohio Regional Center for   1996
  Information Technology
- Session Chair, Ergonomics Society Annual Conference on *Cognitive*   1996
  Quality in Advanced Crew Systems Concepts (United Kingdom)
- Editorial Board of *Handbook of Applied and Engineering Psychology*   1996
- Organizing Committee, IEEE Computer Society Symposium   1996
  on Human Interaction With Complex Systems, Dayton OH
- Chair, Organizing Committee NATO AGARD Symposium on Crew   1996-1998
  Collaboration, Oslo, Norway,
- Chair, Membership Committee; Human Factors & Ergonomics Society   1995-1997
- Program Board: IEEE Int'l Conference on Human-Computer   1995-1997
  Interaction (August 1997)
- Editorial board: *International Journal of Cognitive Ergonomics*   1995-2003
- External Reviewer: Wright-State University Regional Strategic Plan   1995
- HSI Chair, DOD Infrastructure Review   1994
- Editorial board: *Handbook of Human Factors* (Wiley & Sons)   1994-1996
- Chair, DOD Human Systems Interface Panel   1994-1998
- Chair, Joint Directors of Labs Human Systems Interface Panel   1992-1994
- Chair, NATO AGARD Working Group 20 on 3-D Surface Anthropometry,   1992-1995
- Technical Coordination Program Action Group 13: Human   1992-1993
  Systems Integration (TTCP-UAG-13)
- Consultant, National Academy of Sciences/National Research Council:
  Panel on Human Error   1992
- Chair, Human Factors Committee, NATO AGARD, Aerospace   1991-1997
  Medical Panel
- Member, Scientific Task Planning Group for development of the   1990
  Aviation Human Factors National Plan - Federal Aviation Administration
- Steering Committee: International Conference on Human Factors in   1990
  Design for Manufacturability and Process Planning. Honolulu, Hawaii
- Member, NATO Defense Research Group, Panel 8 RSG on Human Error   1990
- Chair, Steering Committee for Crew Systems Ergononics
  Information Analysis Center   1990-2003
- Peer Reviewer, member, IEEE Systems, Man, and Cybernetics Society   1987-1997
- Member, National Research Council/National Academy of Sciences: 1987-2004
  Sponsor Committee on Human Factors
- Member, Office of the Under Secretary of Defense/Defense Logistics   1987-1991
  Agency: Executive Policy Board for Information Analysis Centers
- Member, Panel on Human Factors Specialist Utilization and Education   1987-1990
  National Research Council/National Academy of Sciences
- Member, Visual Simulation Committee of the Tri-Service Simulation   1987-1989
  Technology Advisory Group
- Review Board: USAF Air Safety Mishap Panel   1987-1989

- Chairman: Tri-Service Human Factors Technology Advisory Group (TAG):
  - Human Engineering Guidelines Committee   1987-1989

- Design Support Systems Committee	1986-1988
• Project Officer: Air Standardization Coordinating Committee Working Party 61 - Proj 113, Aeromedical Aspects of Vision &Visual Enhancement	1983-1985
• Reviewer, Applied Vision Association (UK)	1980-1986
• Peer Reviewer Human Factors & Ergonomics Society	1977-2007
• Consulting and critical program review for NASA, FAA, Army Research Institute, Army MANPRINT Office, and AF Aeronautical Systems Center	1977-1991

AWARDS AND HONORS:

• Presidential Rank Award (Nominated by the Secretary of the AF)	2007
• IEEE Senior Member	2004
• Edenfield Executive in Residence; Georgia Institute of Technology	2002-2004
• NATO Scientific Achievement Award	2003
• NATO RTO/HFM Panel Excellence Award	2002
• Fellow, International Ergonomics Association (IEA)	2000
• Fellow, Human Factors & Ergonomics Society	1997
• Department of Defense, Certificate of Merit, Joint Logistics Commanders	1996
• Department of Defense, Technology Transfer Award	1993
• Directors Award, Armstrong Laboratory	1991
• US Patent: Rapid Communication Display Technology, (#4,845,645)	1989
• Scientific and Engineering Technical Achievement Award, Air Force Systems Command	1989
• Best Paper Award - Human Factors Society	1988
• Meritorious Award for Program Management	1985
• Rank Prize award, Cambridge University, UK	1984
• Columbia University Graduate Fellowship	1972-1976

CITATIONS:
- Who's Who in the USA
- Who's Who in America
- Who's Who in the World
- Who's Who in Science & Engineering
- Who's Who in Frontier Science and Technology
- Who's Who of Emerging Leaders in America
- Who's Who in the Midwest
- Who's Who in Society
- Dictionary of International Biography
- International Who's Who of Contemporary Achievement
- Personalities of America

SPECIALIZED TRAINING:

• Managing the Process Enterprise, Hammer & Co, Cambridge, MA	2004
• Vanguard Information Technology & Innovation Workshops	2000-2004
• Management of Technology & Innovation, CalTech, Pasadena CA	2002
• Understanding the S&T Enterprise, Brookings Institute, Wash DC	1999
• Marketing Management, WPAFB	1999

• Competitive Technological Intelligence, Georgia Institute of Technology	1998
• Seven Habits of Highly Effective People, Steven Covey	1998
• First Things First, Steven Covey	1997
• 101 Practices of World Class R&D Management, WPAFB	1995
• USAF Acquisition Professional Development Program, Level III	1994
• Public Policy Challenges Facing DOD, Brookings Institute, Wash DC	1994
• Leadership: Creating Opportunity with a Changing Workforce, WPAFB	1994
• Liberation Management, Tom Peters	1993
• Systems Engineering, AFIT, WPAFB, OH	1992
• Acquisition Management, AFIT, WPAFB, OH	1992
• Human Resource Management Today, American Management Association	1992
• Issues in Science & Technology for Science Executives, Brookings Inst	1990
• Total Quality Management, Deming	1989
• Advanced Human Factors Engineering, University of Michigan	1977

SIGNIFICANT ACCOMPLISHMENTS:
R&D Leadership & Management:

• Senior Mentor and advisor: AFRL International Program encompassing technical agreements with 39 countries	2006-2007
• HE Chief Scientist responsible for quality and value performance of ~$200M/yr R&D portfolio.	1997-2007
• Established AFRL thrust on Revolutionary Human Optimization to capitalize on advances in psycho-pharmacology, robotics and augmented cognition	2005-2007
• Conceived and established the Defense Cognitive Systems Engineering Center under the Dayton-based Wright Brother's Institute.	2001-2007
• Chief of the USAF Armstrong Laboratory Human Engineering Division responsible for breakthrough advances in helmet mounted systems, night-vision systems and advanced crew station concepts.	1991-1997
• Established US/UK MOU on Helmet Systems Technology (VISTA Warrior, Nunn Amendment Program)	1996-2001
• Project Manager: US-Sweden MOU on Air Crew Protection and Performance	1995-2007
• Established: US-French MOU for Super Cockpit Technologies (Nunn)	1993-1997
• Establishing and chaired tri-services/DARPA planning group for Human Systems Interface Technologies. Successfully fielded Master Plan for the $200M FY95 Program for OSD and Congress.	1994-1995
• Lead the formation of the joint service Reliance Human Systems Interface Technology Panel (HSI) and served as first Chairman	1992-1997
• Assembled and managed multi-agency consortia (including Army, Navy, Air Force, NASA, FAA, and NATO AGARD) resulting in principal funding and support of four major research and analytic study projects.	1980-1991
• Conceived, proposed and founded the Crew System Ergonomics Info 2006 Analysis Center (CSERIAC)at Wright-Patterson AFB.An internationally recognized, information and technology clearing house for DoD.	1987-

PATENTS AND PUBLICATIONS:

PATENT: Rapid Communication Display Technology, (1989) US Patent #4,845,645

Rouse, W.B., & Boff, K.R. and Sanderson, P (2012). Complex socio-technical systems - Understanding and influencing the causality of change. IOS Press: Amsterdam

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Rouse, W.R. and Boff, K.R. (1997). Assessing cost-benefits of human factors. In G. Salvendy, (Ed.), *Handbook of Human Factors and Ergonomics.* New York, NY: John Wiley & Sons, Inc.

Boff, K.R. (1994). Ergonomics & military performance. *35th NATO DRG Seminar on Improving Military Performance Through Ergonomics*, Mannheim, GE. AC/243-TP/6, 45-60.

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Rouse, W.B., Cody, W.J., and Boff, K.R. (1991). The human factors of system design: Understanding and enhancing the role of human factors engineering. *International Journal of Human Factors in Manufacturing*, 1, 87-104.

Brown, C.E., Boff, K.R., and Swierenga, S.J. (1991). Cockpit resource management: A social psychological perspective. *Proceedings of the 6th International Symposium on Aviation Psychology*, Columbus, OH, 1, 398-403.

Swierenga, S.J. and Boff, K.R. (1991). Coding techniques for rapid communication displays. *Proceedings of the 6th International Symposium on Aviation Psychology*, Columbus, OH, 1, 204-209.

Matin, E. and Boff, K.R. (1990). An adaptive (tracking) procedure for measuring visual search, *Perceptual & Motor Skills*, 70, 243-253.

Licht, D.M., Polzella, D.J., & Boff, K.R. (1990). Human factors, ergonomics, and human factors engineering: an analysis of definitions. Proceedings of the *98th Annual Meeting of the American Psychological Association*, Boston, MA.

Rouse, W.B., Cody, W.J., Boff, K.R., and Frey, P.R. (1990). Information systems for supporting design of complex human-machine systems. In C.T. Leondes (Ed.), *Advances in Aeronautical Systems*, (Vol. 38 pp. 41-100), San Diego: Academic Press.

Matin, E. and Boff, K.R. (1990). Human-machine interaction with serial visual displays. *Proceedings of the Society for Information Display (SID) Conference*, Las Vegas, NV, 257-260.

Swierenga, S.J., Boff, K.R., and Morton, K. (1990). An engineering perspective on the usefulness and usability of human engineering information in system design. *Proceedings of the 34th Annual Human Factors Society*, Orlando, FL.

Boff, K.R., Polzella, D.J., and Morton, K. (1990). Crew system ergonomics information analysis center: A gateway for technology transfer. *Technology Transfer in a Global Economy: Proceedings of the Technology Transfer Society*, Dayton, OH, 277-282.

Swierenga, S., Morton, K., and Boff, K.R. (1990). Issues concerning the use of human engineering information: The system designers' perspective. *Proceedings of the 42nd National Annual Meeting of the IEEE National Aerospace and Electronics Conference*, Dayton, OH, 881-885.

Boff, K.R. (1990). Factoring ergonomics into system design. CSERIAC *Gateway*, 1(2), 1-2.

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Boff, K.R. and Lincoln, J.E. (1989). *Engineering data compendium: Human perception and performance.* (Compact Disk Edition). Armstrong Aerospace Medical Research Laboratory.

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Lincoln, J.E. and Boff, K.R. (1988). Making behavioral data useful for system design applications: Development of the engineering data compendium. *Proceedings of the 32nd Annual Human Factors Society Meeting*, Anaheim, CA, 1021-1025.

Boff, K.R. and Martin, E.A. (1988). Human performance data in simulation design. *Proceedings of the AIAA Flight Simulation Technologies Conference*, Atlanta, GA, 1-5.

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Matin, E., Boff, K.R., and Donovan, R.S. (1987). Raising control/display efficiency with rapid communication display technology. *Proceedings of the 31st Annual Human Factors Society*, New York, NY, 258-262.

Boff, K.R. (1987). The Tower of Babel revisited: Cross-disciplinary chokepoints in system design. In: W.B. Rouse and K.R. Boff (Eds.), *System design: Behavioral perspectives on designers,tools and organizations*, (pp. 1-13). New York, NY: North-Holland.

Boff, K.R. (1987). Designing for design effectiveness of complex avionics systems. *The Design, Development and Testing of Complex Avionics Systems*, NATO AGARD CP-417, 1-15.

Rouse, W.B. and Boff, K.R. (Eds.) (1987). System design: *Behavioral perspectives on designers, tools and organizations.* New York, NY: North-Holland.

Rouse, W.B. and Boff, K.R. (1987). Workshop themes and issues: The psychology of system design. In: W.B. Rouse and K.R. Boff (Eds.), *System design: Behavioral perspectives on designers, tools and organizations* (pp. 7-17). New York, NY: North-Holland.

Rouse, W.B. and Boff, K.R. (1987). Designers, tools, and environments: State of knowledge, unresolved issues and potential directions. In: W.B.Rouse and K.R. Boff (Eds.), *System design: Behavioral perspectives on designers, tools and organizations*. (pp. 43-63). New York, NY: North-Holland.

Boff, K.R., Kaufman, L., and Thomas, J. (1986). *Handbook of perception and human performance: Vol. 1, Sensation and perception.*. New York, NY: John Wiley & Sons.

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Reitman, W., Weishedel, R., Boff, K.R., Jones, M., and Martino, J. (1985). *Automated information management technology: A technology investment strategy.* (Report No. AFAMRL-TR-85-042.). Wright-Patterson AFB, OH: Paul M. Fitts Human Engineering Division, Harry G. Armstrong Aerospace Medical Research Laboratory.

Boff, K.R., Calhoun, G.L., and Lincoln, J.E. (1984). Making perceptual and human performance data an effective resource for designers. *NATO Defense Research Group Workshop (Panel VIII).* Applications of systems ergonomics to weapon system development, Shrivenham, England. Vol 1, D-93-108

Calhoun, G.L., Arbak, C., and Boff, K.R. (1984). Eye controlled switching for crew station design. *Proceedings of the 28th Annual Meetings of the Human Factors Society,* 1, 258-262.

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Boff, K.R. (1982). Integrated perceptual information for designers. IN *Proceedings of the IEEE National Aerospace and Electronics Conference*. (NAECON), New York, NY: IEEE Publishing Services. 1, 430-434.

Boff, K.R. and Martin, E. (1980). Aircrew information requirements in simulator display design: The integrated cueing requirements study. *Proceedings of the 2nd Inter-- Service/Industry Training Equipment Conference*. Washington, DC: National Security Industrial Association. 355-362.

Boff, K.R. (1979). Part-task trainer for the F-106A MA-1 radar-infrared fire control system: field evaluation of acceptance and utilization. Air Force Human Resources Laboratory Technical Memo.

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Matin, L. and Boff, K.R. (1978). Orientation dependence of vernier distortion and vernier acuity. *Supplement to Investigative Ophthalmology and Visual Science*. Vol 23 (4), 133.

Boff, K. R. (1978). *The influence of rotary target motion on perceived vernier offset and vernier acuity.* Dissertation. Columbia University, New York, NY.

Boff, K.R., and Matin, L. (1977). Velocity independence of vernier offset produced by rotary target motion. *Supplement to Investigative Ophthalmology & Visual Science*. Vol 22 (4).

Matin, L., Boff, K.R., and Pola, J. (1976). Vernier offset with rotary target motion. *Perception and Psychophysics.* Vol. 20 (2), 138-142.

CHAIRED WORKSHOPS AND PROFESSIONAL SHORT COURSES
- Chair and prime organizer of the Workshop on Interdisciplinary Workshop on Influence and Persuasion in the Formation and Sustainment of Social-Fringe Groups. Kuching, Malaysia. Feb 2012.
- Chair and prime organizer of the Workshop on "Understanding and influencing the causality of change in complex socio-technical systems. Queensland, Australia. Feb 2011.
- Senior Mentor: Interdisciplinary workshop on society, culture and language, University of Plymouth, UK. Nov 2010.
- Senior Mentor: Workshop on methodological and theoretical issues in the study of values in Islamic countries. Cairo, Egypt. Jun 2010.
- Chair & Principal Organizer, The Etiology and Impact of Digital Natives on Societies, Cultures and Commerce. Korean Advanced Institute of Science and Technology (KAIST), Taejeon, SK. November 2009

- Chair & Principal Organizer, Culture: Affect, Behavior and Cognition. A Multi-disciplinary WS. Lankawi, Malaysia, December 2008
- Director, WS on Organizational Simulation, Clearwater, FL, December 2003
- Director, Strategies for Value WS. Atlanta GA, June 2001
- Director, Getting to Value: Enhancing Quality, Productivity and Innovation; Dayton OH, Nov 2000
- Director, Planning for Innovation WS; Stone Mountain, GA, Feb 2000
- Director, Putting Technology To Work Workshop; Sinclair College, Dayton OH, October, 1998
- Chair: *3-D Surface Anthropometry Working Group*. NATO AGARD, April 1993-1995
  Wright-Patterson AFB OH, April 1995
  Universite Rene Descartes a Paris, Paris, France, October 1994
  National Research Council, Ottawa, Canada, April 1994
  Escola Do Servico De Saude Militar, Lisbon, Portugal, October 1993
  DKFZ, Heidelberg, Germany, April 1993
- Director: Short Course - *Human Factors: Case Studies & Applications in Engineering Design* Crew System Ergonomics Information Analysis Center (CSERIAC). Dayton, OH; June 1990.
- Director: Short Course - Engineering for Man-Machine Systems: Human Performance for System Designers. The University of Dayton. Dayton, OH, June 1988.
- Director: Short Course - *Human Engineering Design Considerations for Aircrew Station Modification*; NATO AGARD, June 1988.
  Escola Do Servico De Saude Militar, Lisbon, Portugal.
  War Museum. Athens, Greece.
  Delft University of Technology. Delft, Netherlands.
- Co-Director: *The Psychology of System Design Workshop*, Lake Lanier, GA, March 1986.
- Director: *Human Perception and Performance* Workshop for System Designers. The University of Dayton, Dayton, OH; June 1986.
- Director: *Automated Information Management Technology Workshop*. Dayton, OH; April 1984.
- Director: *Integrated Perceptual Information for Designers Workshop*. Air Force Institute of Technology, Wright-Patterson AFB, OH; March 1981.

KEYNOTES, INVITED COLLOQUIA AND SPECIAL PRESENTATIONS:

Invited Colloquium: Implementing Human Factors in Complex Adaptive Systems. University of Linkoping, Linkoping SW. April 2009

Invited Presentation: Challenges Implementing "Effective" HCIV Solutions in Complex Systems.   Fraunhofer Institute, Kaiserslautern GE. March 2009

Invited Keynote Address: Complex Systems Perspective on the Revolution in Human Performance Optimization. Complex 2007, Gold Coast AU

Invited Keynote: Revolutions in human system integration: Exploring the impacts of rapidly shifting paradigms. HCI-Aero 2006. Seattle WA. Sept 2006

Invited Keynote: Revolutions and shifting paradigms in human factors and ergonomics. 50th Anniversary Meeting of International Ergonomics Association. Maastricht, NE. July 2006

Invited Presentation: Swedish Defense Research Agency (FOI). Linkoping, Sweden. June 2006

Invited Keynote: From HSI to CSI: Homunculus redux? International Conference on Augmented Cognition, Las Vegas, NE. July 2005

Invited Speaker: MANPRINT: Transforming for the soldier workshop. Arlington, VA. 2004

Invited Colloquium: Mind over matter: Cognitive science, modeling and engineering in the Air Force. Georgia Institute of technology. Atlanta GA. October 2002

Invited Keynote: Human factors R&D: A strategy for the new millennium. ASEAN Ergonomics '2000. Singapore, November 2000.

Invited Capstone Speaker. How abstract is too abstract? How real is too complex? *CODATA Euro-American Workshop, "Visualization of Information and Data, Where are We and Where Do We Go From Here?,"* Paris, FR. June 1997

Invited Speaker, EuroVis Symposium. University of Kaiserslautern, GE, June 1997

Invited Plenary Address. Human technology integration: A framework for the future. *AGARD 2020 Spring Symposium*, Paris, FR. April 1997.

Invited Presentation: (with W.R. Rouse) "*Support to cost-effectiveness assessment in systems acquisition,"* Joint US/UK workshop on Human Factors. San Diego CA, February 1997

Invited Presentation: *"Making the Case for Human Factors".* National Academy of Sciences Workshop. Wash DC, December 1996.

Invited Keynote Address: Making visualization work: how abstract is too abstract - how real is too complex? *IEEE Symposium on Information Visualization*. San Francisco CA, October 1996.

Invited Keynote Address: Complex system interfaces: some chokepoints on the road from theory to applications. *IEEE Computer Society Symposium on Human Interaction with Complex Systems*. Dayton OH, August 1996

Invited Keynote Address: Human Engineering: Advanced Human System Interface Technologies, *Fifth International Conference on Human-Machine Interaction and Artificial Intelligence in Aerospace*, Toulouse, France. September 1995

Invited Keynote Address: Human Engineering In the US Air Force: *Conference on Human Factors in Aviation*, Linkoping Technical University, Linkoping, Sweden. May 1995

Invited Presentation: Human factors in the US Air Force. National Academy of Sciences, Human Factors Committee. Wash DC, April, 1995.

Invited Keynote address: Ergonomics & Military Performance. Presented at the *35th NATO DRG Seminar on Improving Military Performance Through Ergonomics*, Mannheim, GE, September 1994.

Colloquium: *Human Factors in the Wild: A Profile of the Fitts Human Engineering Division.*   Wright State University, Departments of Human Factors and Computer Sciences, Dayton, OH, April, 1994.

Colloquium: *Usefulness and Usability of Human Factors Data*: University of Toronto, Canada, December 1993

Invited Address: Ergonomics in Motor Vehicle Manufacturing, Issues and Opportunities. *Motor Vehicle Manufacturer's Association Symposium*, Livonia, MI, June, 1992.

Colloquium: *Human Factors in System Design*. The HUSAT Research Centre, Leicestershire, UK, November, 1989.

Invited Address: *Integration of Human Factors Research with Systems Development.*
1. DCIEM. Toronto, Canada. February, 1989.
2. Canadian National Research Council. Ottawa, Canada, February 1989.

Invited Address: *Crew System Ergonomics Information Analysis*. National Research Council. Washington, DC, March, 1989.

Invited Address: Human Factors in Design. *The Fourth Mid-Central Ergonomics/Human Factors Conference*, University of Illinois, Champaign-Urbana, IL, July, 1987.

Colloquium: *Human Factors: From Research to Applications*. CERMA. Paris, France, September 1987.

Colloquium: *Engineering of Ergonomics Knowledge.* RAF Institute of Aviation Medicine. Farnborough, UK, September 1987.

Colloquium: *Aiding the Design of Complex Human System Interfaces*. The Human Sciences and Advanced Technology Research Center (HUSAT). Loughborough, England, December 1987.

Colloquium: *Usability of Human Performance Data for System Design*. MRC Applied Psychology Unit, Cambridge, England, December 1987.

Colloquium: *Integrating Perceptual Information into Interface Design*. XEROX
EUROPARC. Cambridge, England, December 1987.

Colloquia: *Human Performance in System Interface Design:* Japan, April 1985.
University of Tokyo, Komaba, Tokyo
University of Kyoto, Kyoto
University of Osaka, Toyonaka, Osaka
Aichi Institute of Technology, Toyota
Hosei University, College of Engineering, Tokyo
Hitachi Ltd., Kokubunji, Tokyo
Japanese Auto Research Institute, Tsukuba

Computer-Aided Systems Human Engineering: A Hypermedia Design Tool.
35th Annual Human Factors Society Meeting, San Francisco, CA, September, 1991.

Understanding the Usefulness and Usability of Technical Information. *NATO/AGARD
Technical Information Panel.* Brussels, Belgium, November, 1989.

Matching Crew System Specifications to Human Performance Capabilities*, NATO AGARD*.
Stuttgart, Germany, September 1987.

Factoring Ergonomics Data into System Design. *Symposium of Air Standardization
Coordinating Committee, WP 10*, RAF North Luffenham, Stamford, Leicestershire, UK,
September 1986.

Information Transfer From Research to Applications: The Roles of Archival Publications.
IEEE International Conference on Systems, Man, and Cybernetics. Atlanta, GA,
October 1986.

Invited Address: Human Performance Considerations in the Display of Information in
Depth. *Rank PrizeConference: Biological and Engineering Aspects of Visual
Hyperacuity, Depth Perception and 3-D Displays*. Trinity College, Cambridge, England,
January 1984.

A Philosophy for Integrated Perceptual Information for Designers. *Annual Meetings of the
American Psychological Association*., Anaheim, CA, September 1983.

Advanced Display Concepts and Integrated Perceptual Information for Designers. *NASA
Human Role in Space Workshop*. Leesburg, VA, August 1982.

Advanced Applications for 3-D Perception. *First Annual Adelphi University Applied
Experimental Psychology Conference*, New York, NY, October 1982.

Colloquium: *Use of Perceptual Data in Display Design*. Graduate Psychology/Human
Factors Program, Wright State University, Dayton, OH, May 1981.

The Use of Perceptual Data in Training Device Design. *Annual Meeting of the American Psychological Association*. Montreal, Canada, September 1980.

Invited lectures: *Pilot Cues and Psychological Aspects of Flight Simulation*, AIAA/University of Dayton, Dayton, OH, March/October 1980.

Colloquium: *Visual Perception and Dynamic Computer Generated Images.* Electrical Engineering and Psychology Departments, University of Rhode Island, April 1980.

Invited Lecture: *Visual Perception and Flight Simulation, Graduate Psychology/Human Factors Program,* Wright State University, Dayton, OH, May 1980.

Integrated Perceptual Information for Designers, *Bi-Annual Human Factors Technology Advisory Group,* New Orleans, LA, October 1980.

Integrated Cueing Requirements Study. *2nd Interservice/Industry Training Equipment Conference*, Salt Lake City, UT, 1980.

Vernier Offset Resulting from Induced Visual Latency. *Association for Research in Vision and Ophthalmology,* Sarasota, FL, May 1979.

Integrated Cueing Requirements for Flight Simulation. *Annual Meeting of the American Psychological Association*, New York, NY, September 1979.

Integrated Cueing Requirements for Flight Simulation, *NATO/AGARD Working Group 10*, Orlando, FL, November 1979.

Orientation Dependence of Vernier Distortion and Vernier Acuity. *Association for Research in Vision and Ophthalmology*, Sarasota, FL, May 1978.

Orientation Selectivity for Processing of Vernier Offsets. *Annual Meeting of the Eastern Psychological Association,* Washington, D.C., 1978.

Velocity Independence of Vernier Offset Produced by Rotary Target Motion. *Association for Research in Vision and Ophthalmology*, Sarasota, FL, May, 1977.

An Illusion of Vernier Offset with Rotating Targets. *Annual Meeting of the Eastern Psychological Association*, New York, NY, September, 1974.